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None

(58) Field of search
UK CL (Edition K) G4T TAB TAD TAE TAX
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(54) **Ticket system**

(57) In a ticket system a ticket (23) is provided with a transceiver (29) and a memory (33) whereby broadcast data can be received and stored in the ticket (23) and the data stored on the ticket can be remotely interrogated. The system provides a transmitter located at a position other than the exit to a transport facility. When the ticket passes the transmitter a signal is broadcast carrying data identifying the position of the transmitter. The data is stored in the ticket memory. Upon exit from the transport facility the ticket memory is remotely interrogated by an exit machine. The data so acquired is used to test the validity of the ticket for the journey undertaken.

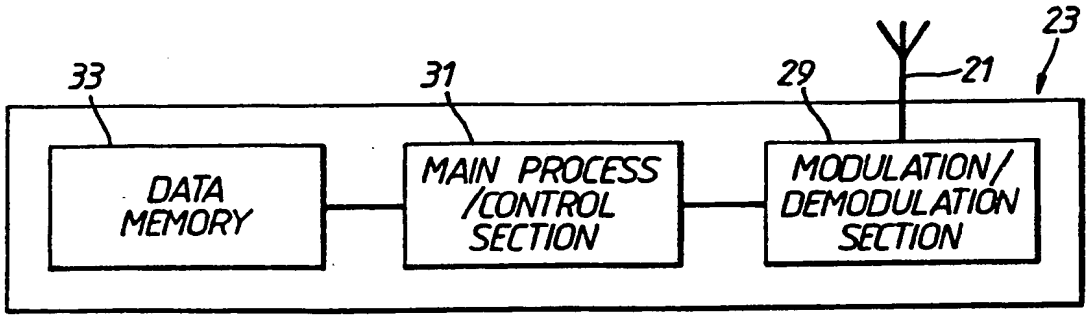

Fig.2.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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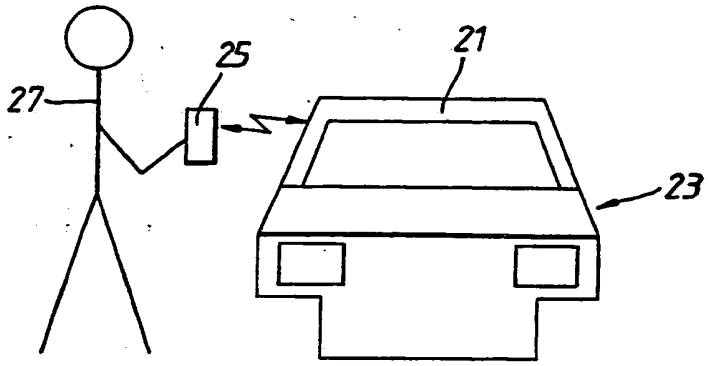

Fig.1.

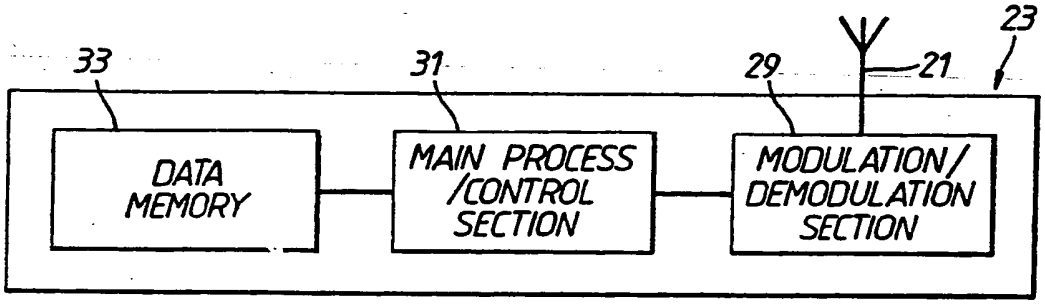

Fig.2.

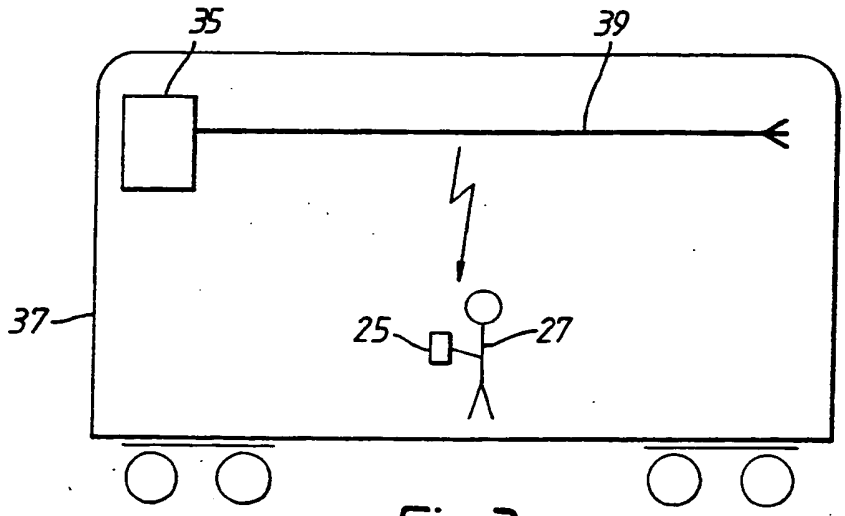

Fig.3.

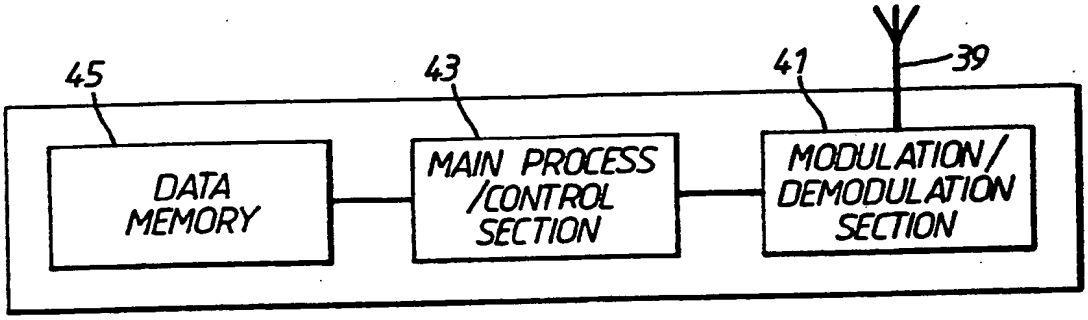

Fig.4.

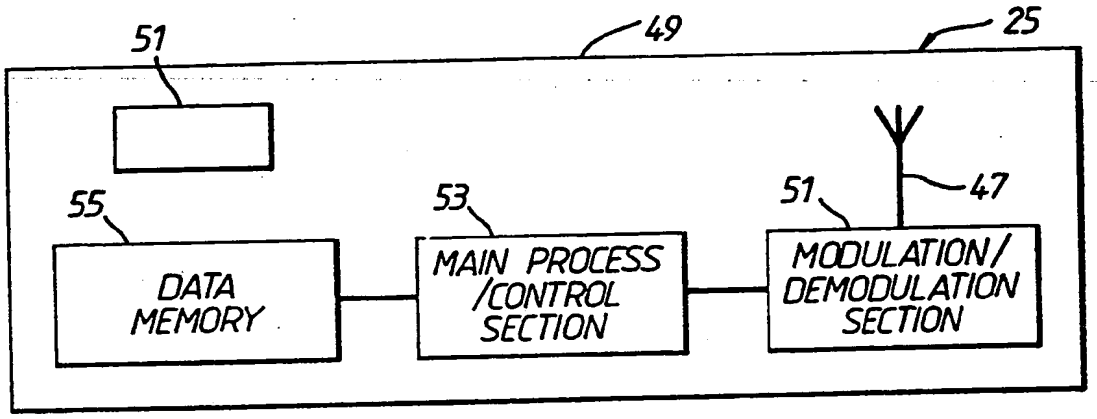

Fig.5.

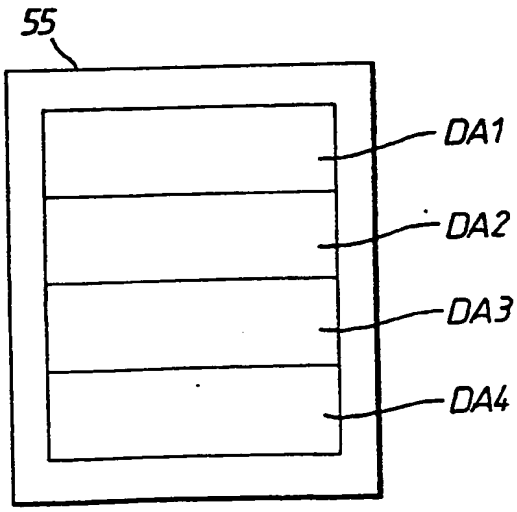

Fig.6.

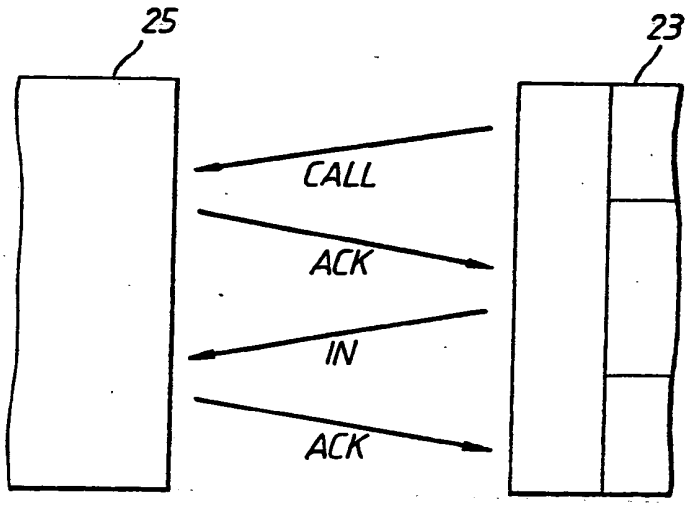

Fig.7.

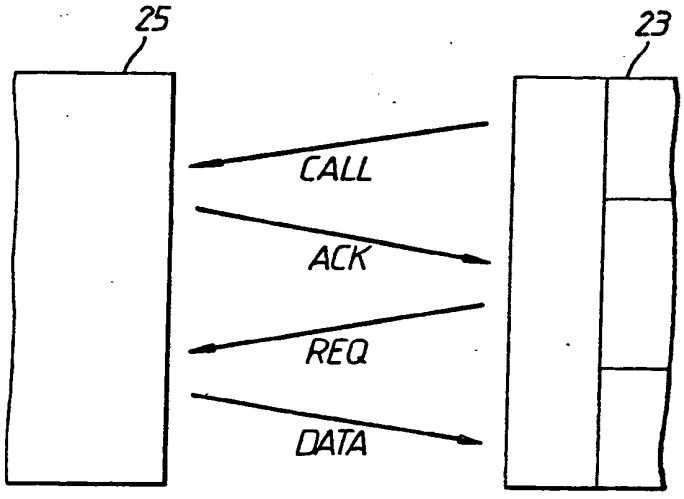

Fig.8.

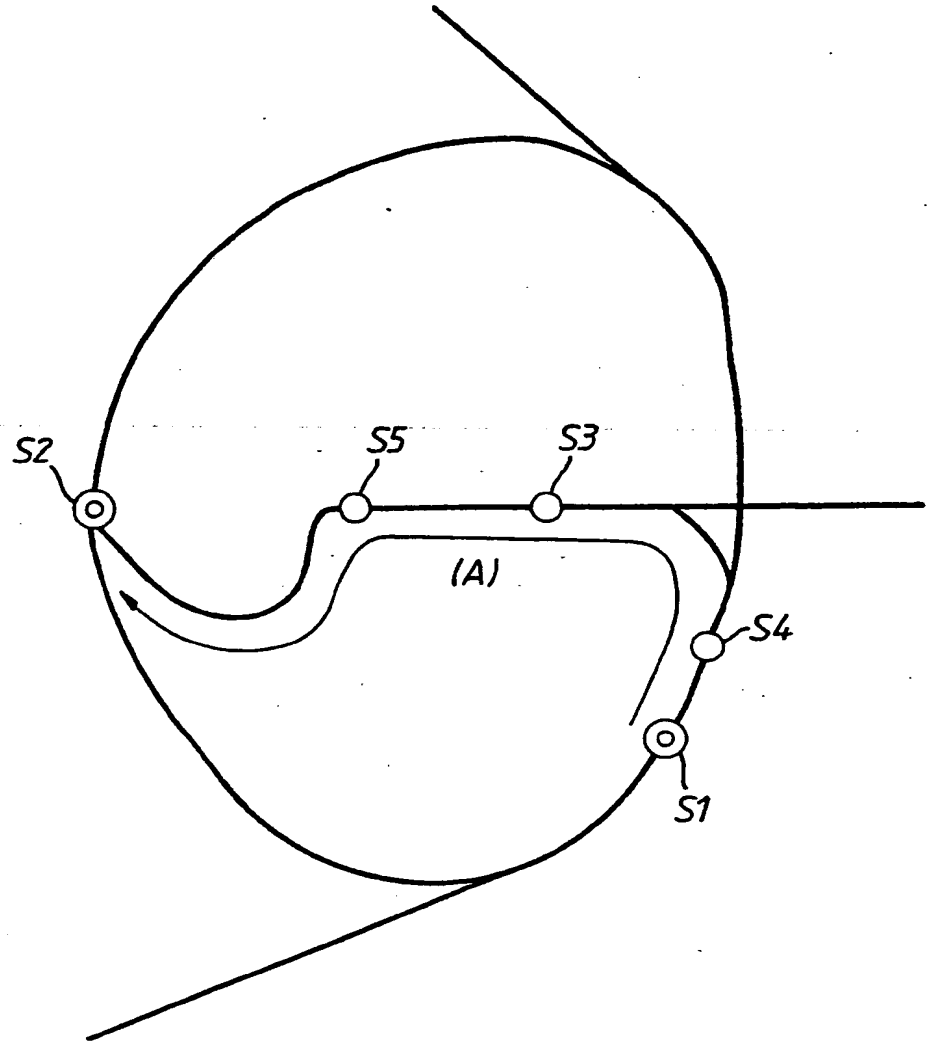

Fig.9.

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A TICKET AND A TICKET PROCESSING SYSTEM

The present invention relates, in general, to a ticket (portable memory medium) and a processing system using the portable memory medium. In particular, the invention relates to a ticket and a system for processing the ticket used in transport facilities such as railways.

Various transport facilities are used to transport a large number of passengers. In such transports, a ticket inspector checks tickets carried by the passengers when the passengers pass a ticket gate and on board the transport vehicle .

Recently, advanced technology has enabled a ticket system in which information is magnetically recorded on the ticket to be used. In such a system, railway tickets are issued by an automatic ticket vending machine. The design of the system is such that information is magnetically recorded on the ticket and subsequently read out by an automatic ticket inspecting machine (automatic fare collection system) when the passenger passes the ticket gate to determine whether or not the ticket is valid for a particular journey and valid at that date and time.

With known ticket system on railways it is possible to make illegal use of the system. For example, the system can be deceived by a passenger using two unconnected railway tickets, one of which is used when boarding a train and the other when leaving a train. To detect such illegal use of a

ticket, an improved system has been devised. In this system, the entrance data is magnetically recorded on the railway ticket by the automatic ticket inspecting machine when the passenger enters the platform and the entrance data is read out from the railway ticket by the automatic ticket inspecting machine when the passenger leaves the platform. The illegal use of the railway ticket is determined if the entrance data has not been recorded on the railway ticket.

However, in the above-described improved inspecting system, such an automatic ticket inspecting machine has to be installed at all railway stations to effectively operate the system. Furthermore, even if an automatic ticket inspecting machine is installed at every railway station, it is difficult to determine the illegal use of a ticket if the passenger insists that he or she did not use the automatic ticket inspecting machine but passed through a ticket gate at which ticket inspection is visually carried out by a ticket inspector.

Accordingly, it is an object of the present invention to provide a ticket and ticket system which alleviates the aforementioned disadvantages of the prior art.

According to one aspect of the present invention, there is provided a ticket including a memory and a receiver device for receiving data transmitted electromagnetically and storing data indicating the station at which the passenger enters and data indicating the point through which the passenger passes, and, a transmitter section for transmitting

the entrance station data and the passing point data upon interrogation.

According to another aspect of the present invention, there is provided a system for processing a ticket according to the preceding statement and which is transported by a vehicle moving along a prescribed route comprising means provided in the vehicle for receiving passing point data indicative of the vehicle passing a specified passing point, and a transmitter provided in the vehicle for transmitting the passing point data for recordal in the ticket memory.

According to still another aspect of the present invention, there is provided an automatic ticket inspecting system used in a railway operation, comprising a timing device located at a prescribed point for radiating a signal, an output device, provided in a train, for outputting passing point data indicating a prescribed point in response to the signal from the timing device when the train passes the prescribed point, a portable memory ticket including a receiver section for receiving the passing point data, a first memory section for storing the passing point data and entrance station data, a second memory section for storing data indicating the period of ticket validity and the journey over which the ticket is valid and an output section for outputting the passing point data, the entrance station data, the valid period data and the valid journey data in response to a request, and an automatic ticket inspecting device including a transmitter section for transmitting the entrance

station data to the portable memory ticket by a passenger when the passenger passes through the ticket inspecting device to enter the platform, a request signal output section for requesting the output of data from the portable memory ticket when the passenger passes through the ticket inspecting device to leave the platform, a receiver section for receiving the passing point data, the entrance station data, the valid period data and the valid journey data from

the portable memory ticket, and an inspecting section for determining the validity of the portable memory ticket based on the passing point data, the entrance station data, the valid period data and the valid journey data from the receiving means.

These and other objects and advantages of this invention will become more apparent and more readily appreciated from the following detailed description of the presently preferred exemplary embodiment of the invention, taken in conjunction with the accompanying drawings, wherein like reference numerals throughout the various figures denote like structure elements and wherein:

FIGURE 1 is a view illustrating an automatic ticket inspecting machine and a radio type railway ticket card of one embodiment carried by a passenger;

FIGURE 2 is a block diagram of the automatic ticket inspecting machine shown in FIGURE 1;

FIGURE 3 is a schematic view illustrating a railway train wherein a passing point code data transmitter of one embodiment is arranged and the radio type railway ticket card carried by the passenger;

FIGURE 4 is a block diagram of the passing point code data transmitter shown in FIGURE 3;

FIGURE 5 is a block diagram of the radio type railway ticket card shown in FIGURES 1 and 3;

FIGURE 6 is a schematic view illustrating data areas of

a data memory shown in FIGURE 5;

FIGURE 7 is a sequence diagram illustrating data exchange between the automatic ticket inspecting machine and the radio type railway ticket card shown in FIGURE 1;

FIGURE 8 is a sequence diagram illustrating data exchange between the automatic ticket inspecting machine and the radio type railway ticket card; and

FIGURE 9 is a view illustrating a railway map and a plurality of stations on the map.

A preferred embodiment of the present invention will be described in more detail with reference to the accompanying drawings. As shown in FIGURE 1, an antenna 21 is provided on an upper side of an automatic ticket inspecting machine 23. Automatic ticket inspecting machine 23 executes a read/write operation to a radio type railway ticket card 25 carried by a passenger 27 through antenna 21 when passenger 27 passes through automatic ticket inspecting machine 23. As shown in FIGURE 2, antenna 21 of automatic ticket inspecting machine 23 is connected to a modulation/demodulation section 29. Modulation/demodulation section 29 demodulates radio wave signals received through antenna 21 to digital signals, or modulates a carrier wave with digital signals indicating required data to transmit the required data through antenna 21. Modulation/demodulation section 29 is controlled by a main process/control section 31. Main process/control section 31

also controls a data memory 33 to send data stored in data memory 33 to antenna through modulation/demodulation section 29. Data memory 33 stores data, e.g., station code data. However, automatic ticket inspecting machine 23 may not have a data memory 33 but instead may access a large capacity base memory, which is generally installed far from the automatic ticket inspecting machine 23. The main memory generally stores all data required for the railway operation.

A passing point code data transmitter 35 shown in FIGURE 3 is provided in a train 37. Passing point code data transmitter 35 transmits a radio signal of passing point code data corresponding to a prescribed station through an antenna 39 to radio type railway ticket card 25 carried by passenger 27 on train 37 when the train stops at or passes through the prescribed station. In this case, an oscillator (not shown) radiating a specific timing signal indicating a prescribed station code may be installed at the prescribed station and passing point code data transmitter 35 may transmit a radio signal of the way station code data as passing point code data when passing point code data transmitter 35 detects the specific timing signal radiated from the oscillator. If train 37 is an express, such a data transmitting operation is carried out when train 37 passes the oscillator located at the prescribed station. The oscillator may be located at a prescribed

point between two stations. The data transmitting operation of passing point code data transmitter 35 may also be carried out when train 37 passes the prescribed point at which the oscillator is located.

As shown in FIGURES 3 and 4, antenna 39 extending along the length direction of train 37 is connected to modulation/demodulation section 41 of passing point code data transmitter 35. Modulation/demodulation section 41 is controlled by a main process/control section 43. A data memory 45 is also controlled by main process/control section 43. Data memory 45 previously stores a plurality of different passing point code data. When main process/control section 43 receives the specific timing signal from the oscillator through antenna 39 and modulation/demodulation section 41, a prescribed passing point code data corresponding to the specific timing signal is read out from data memory 45 and is transmitted to antenna 39 through modulation/demodulation section 41. Then, the prescribed passing point code data is transmitted to radio type railway ticket card 25.

The construction of radio type railway ticket card 25 will now be described. In FIGURE 5, an antenna 47 formed on the surface of a flat base 49 of radio type railway ticket card 25 is connected to a modulation/demodulation section 51. Modulation/demodulation section 51 demodulates a radio wave signal received through antenna 47 to a digital signal

or modulates a carrier wave with digital signals to transmit through antenna 47. Modulation/demodulation section 51 is controlled by a main process/control section 53. Main process/control section 53 also controls a data memory 55 to send data stored in data memory 55 to modulation/demodulation section 51 or to store data fed from modulation/demodulation section 51 to data memory 49. Main process/control section 31 and data memory 55 may be composed of a single-chip microcomputer. A battery 57, e.g., a thin film battery, is provided in flat base 43 to supply power to main process/control section 53, modulation/demodulation section 51 and data memory 55.

One example of the data area arrangement of data memory 55 will be described. As shown in FIGURE 6, data memory 55 is divided into four data areas DA1, DA2, DA3 and DA4. First data area DA1 stores entrance station code data and second data area DA2 stores passing point code data (way station code data). Third data area DA3 stores valid period data and fourth data area DA4 stores valid journey data (that is, the portion of the transport system for which the ticket is valid).

The operation of the above-described railway ticket inspecting system will now be described.

A first operation is carried out between automatic ticket inspecting machine 23 and radio type railway ticket card 25 carried by passenger 27 when the passenger 27 passes

through automatic ticket inspecting machine 23 to enter the platform. When the passenger 27 puts radio type railway ticket card 25 close to antenna 21 of automatic ticket inspecting machine 23, as shown in FIGURE 1, a call signal CALL radiated from automatic ticket inspecting machine 23 through antenna 21 is received by radio type railway ticket card 25 through antenna 47, as shown in FIGURE 7. The state of radio type railway ticket card 25 is changed from a standby mode to a communication mode. Main control section 53 of radio type railway ticket card 25 transmits an acknowledgement signal ACK to automatic ticket inspecting machine 23 through modulation/demodulation section 51 and antenna 47 and clears second data area DA2 of data memory 55 in which passing point code data is stored.

In response to the acknowledgement signal ACK fed from radio type railway ticked card 25, automatic ticket inspecting machine 23 transmits entrance station code data IN to radio type railway ticket card 25 through antenna 21. Radio type railway ticket card 25 receives entrance station code data IN through antenna 47 and stores entrance station code data IN to first data area DA1 of data memory 55. Then, main process/control section 53 of radio type railway ticket card 25 again transmits the acknowledgement signal ACK to automatic ticket inspecting machine 23 through modulation/demodulation section 51 and antenna 47 and enters the standby mode. When the acknowledgement signal ACK from

radio type railway ticket card 25 is received by automatic ticket inspecting machine 23, the above-described first operation sequence is completed. However, if the acknowledgement signal ACK is not received by automatic ticket inspecting machine 23, the communication to radio type railway ticket card 25 is repeatedly tried by automatic ticket inspecting machine 23.

A second operation is carried out during the operation of the train 37 that passenger 27 has taken. When the train 37 reaches a prescribed station or a prescribed point, passing point code data transmitter 35 arranged in the train 37 detects the specific timing signal indicating the prescribed station code or the prescribed passing point code from the oscillator (not shown) located at the prescribed station or the prescribed point. Upon the detection of the specific timing signal, main process/control section 43 radiates a call signal and reads a specific passing point code data TS from data memory 45 on the basis of the specific timing signal and radiates the passing point code data TS from antenna 39 extending along the length direction of train 37. Since main process/control section 53 of radio type railway ticket card 25 carried by passenger 27 has been in the communication mode, main process/control section 53receives receives the call signal from passing point code data transmitter 35 to change the standby mode thereof to a receiving mode. Thus, main process/control section 53 of

radio type railway ticket card 25 receives passing point code data TS through antenna 47 and modulation/demodulation section 51 and stores passing point code data TS in second data area DA2 of data memory 55. Then, radio type railway ticket card 25 enters the standby mode, and thus,the second operation is completed. If card 25 did not contact with automatic ticket inspecting machine 23 when passenger 27 enters the platform, card 25 has been in the standby mode and thus, the passing point code data TS is not stored in card 25.

A third operation is carried out between radio type railway ticket card 25 and automatic ticket inspecting machine 23 when passenger 27 passes through automatic ticket inspecting machine 23 to leave the platform.

When passenger 27 puts radio type railway ticket card 25 close to antenna 21 of automatic ticket inspecting machine 23, the call signal CALL radiated from automatic ticket inspecting machine 23 is received by radio type railway ticket card 25 and radio type railway ticket card 25 changes the standby mode thereof to the communication mode. Radio type railway ticket card 25 transmits the acknowledgement signal ACK to automatic ticket inspecting machine 23 through antenna 47, as shown in FIGURE 8. Automatic ticket inspecting machine 23 receives the acknowledgement signal ACK from radio type railway ticket card 25 and transmits a request signal REQ to enable radio

type railway ticket card 25 to transmit data stored in data memory 55.

When radio type railway ticket card 25 receives request signal REQ from automatic ticket inspecting machine 23, main process/control section 53 of radio type railway ticket card 25 reads out valid period data VP previously stored in third data area DA3, valid section data VS previously stored in fourth data area DA4, entrance station code data IN stored in first data area DA1 and passing point code data ST stored in second data area DA2 and serially transmits each data to automatic ticket inspecting machine 23 through modulation/demodulation section 51 and antenna 47.

Based on each data transmitted from radio type railway ticket card 25, main process/control section 31 of automatic ticket inspecting machine 23 determines whether or not radio type railway ticket card 25 is used appropriately. Main process/control section 31 of automatic ticket inspecting machine 23 determines the validity of radio type railway ticket card 25 according to valid period data VP and the correct use of radio type railway ticket card 25 based on valid journey data VS, entrance station code data IN and passing point code data ST. If the correct use of radio type railway ticket card 25 is determined by main process/control section 31 of automatic ticket inspecting machine 23, the gate (not shown) generally equipped in automatic ticket inspecting machine 23 is opened. Thus,

passenger 27 can pass through the gate. Otherwise, the gate is maintained at its closed position and passenger 27 can not pass through the gate.

An explanation will be carried out in accordance with the above-described one embodiment of the present invention when passenger 27 takes the train from station S1 to station S2 along the route indicated by an arrow (A) shown in FIGURE 9.

entrance station code data IN is transmitted from automatic ticket inspecting machine 23 to radio type railway ticket card 25 and is stored in first data area DA1 of data memory 55 when the train is boarded at station S1. Passing point code data TS is also transmitted from passing point code data transmitter 35 to radio type railway ticket card 25 when train 37 passes station S3 and is also stored in second data area DA2 of data memory 55. Thus, entrance station code data IN and passing point code data TS have been stored in the corresponding data areas DA1 and DA2 of data memory 55 of radio type railway ticket card 25 when passenger 27 leaves train 37 at station S2.

However, if passenger 27 uses two season tickets wherein one is valid from station S1 to station S4 and the other is valid from station S5 to station S2, passing point code data ST corresponding to station S3 has been stored in data memory of the one season ticket whereas the one season ticket is valid only from station S1 to station S4. On the

other hand, passing point code data ST is also stored in the the data memory of the other season ticket whereas the other season ticket is valid between station S2 and station S5. If passenger uses the other season ticket, illegal use of ticket is determined when passenger 27 leaves station S2. This is because passing point code data ST corresponding to station S3 has been stored in both one and the other season tickets whereas use of one or the other season ticket for the section bewteen station S4 and station S4 including station S3 is not valid.

In the above-described embodiment, passing point code data TS is simply transmitted from passing point code data transmitter 35 to radio type railway ticket card 25. However, identification code data ID for different railway companies may be added to passing point code data TS. Also, identification code data ID may be stored beforehand in data memory 55 of radio type railway ticket card 25. The received identification code data ID and the previously stored identification code data ID may be compared when the way station code data TS is transmitted from passing point code data transmitter 35 to radio type railway ticket card 25. Passing point code data TS will be stored in data memory 55 of radio type railway ticket card 25 only when two identification code data ID are agreed. Thus, passing point code data TS is not written to a radio type railway ticket card which is used on other railway companies.

Furthermore, passing point code data TS may be output from a transmitter installed at a prescribed point or station, and the passing point code data transmitter installed in the train may receive the passing point code data TS and may simply send the code data TS to the radio type railway ticket card carried by the passenger. In this case, the data memory wherein passing point code data is stored may be eliminated from the passing point code data transmitter.

In the above-described embodiment, second data area DA2 of data memory 55 storing passing point code data TS is cleared when passenger 27 passes through automatic ticket inspecting machine 21 to enter the platform. However, second data area DA2 of data memory 55 may be cleared when passenger 27 leaves the platform. Data transmission between automatic ticket inspecting machine 23 and radio type railway ticket card 25 is carried out by radio signals in one embodiment. However, a magnetic recording medium may be provided on radio type railway ticket card 25, and the data exchange between automatic ticket inspecting machine 23 and radio type railway ticket card 25 may be carried out by automatic ticket inspecting machine 23 which executes a read/write operation to the magnetic recording medium arranged on radio type railway ticket card 25.

According to the present invention, since passing point code data TS is stored in a portable memory medium (radio

type railway ticket card), the illegal use of a railway ticket can be detected and thus, staff aboard the vehicle are not required to inspect the ticket.

CLAIMS

1. A ticket comprising:

a transceiver adapted to receive entrance station data indicating the station at which the ticket enters a transport system and passing point data indicating a position on the route along which the ticket passes;

a memory for storing the entrance station data and the passing point data; and

said transceiver being adapted to transmit the entrance station data and the passing point data in response to a request.

2. A ticket according to claim 1, wherein the memory includes a validity location for storing period of validity data and valid journey data, and the transceiver includes a means for transmitting the valid period data and the valid journey data in response to the request.

3. A ticket system for a transport facility comprising

a ticket having a transceiver adapted to receive and record data on a ticket memory and

a transmitter at a position at, or between a station for access to the transport facility and a station for exit from the transport facility whereby data identifying the position of the transmitter is transmitted for reception by the ticket transceiver and storage in the ticket memory.

4. A system according to claim 3 wherein the transmitter device is located at a passing point on the route followed by the vehicle and transmits the passing point data to a transceiver device carried by the vehicle said vehicle transceiver device being adapted to respond to reception of the passing point signal by broadcasting the passing point data for reception by a ticket carried in the vehicle.

5. A system according to claim 4 wherein the signal transmitted by the passing point signal is a timing signal and the signal broadcast by the vehicle transceiver is a data code signal.

6. A system according to claim 4 or claim 5 wherein the transceiver device is adapted to instruct the erasure of previously stored passing point data.

7. A system according to claim 4 or claim 5 wherein the vehicle transceiver includes a processor to receive data from the ticket transceiver indicative of the journey for which the ticket is valid and to determine the validity of the ticket from the valid journey data and the passing point data.

8. A system according to any one of claims 3 to 7 wherein the transmitter is positioned at the access station to transmit data indicative of the access station for recordal on a passing ticket.

9. A system according to any one of claims 3 to 8 wherein a ticket inspection machine is provided at an exit from the transport facility, the ticket inspection machine having an inspection transceiver adapted to transmit an interrogation signal for reception by the ticket transceiver, the ticket being responsive to the interrogation signal to transmit the data stored in its memory, the inspection transceiver receiving the ticket data and processing the data to verify the validity of the ticket.

10. A ticket as herein described with reference to the accompanying figures.

11. A ticket system as herein described with reference to the accompanying figures.

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